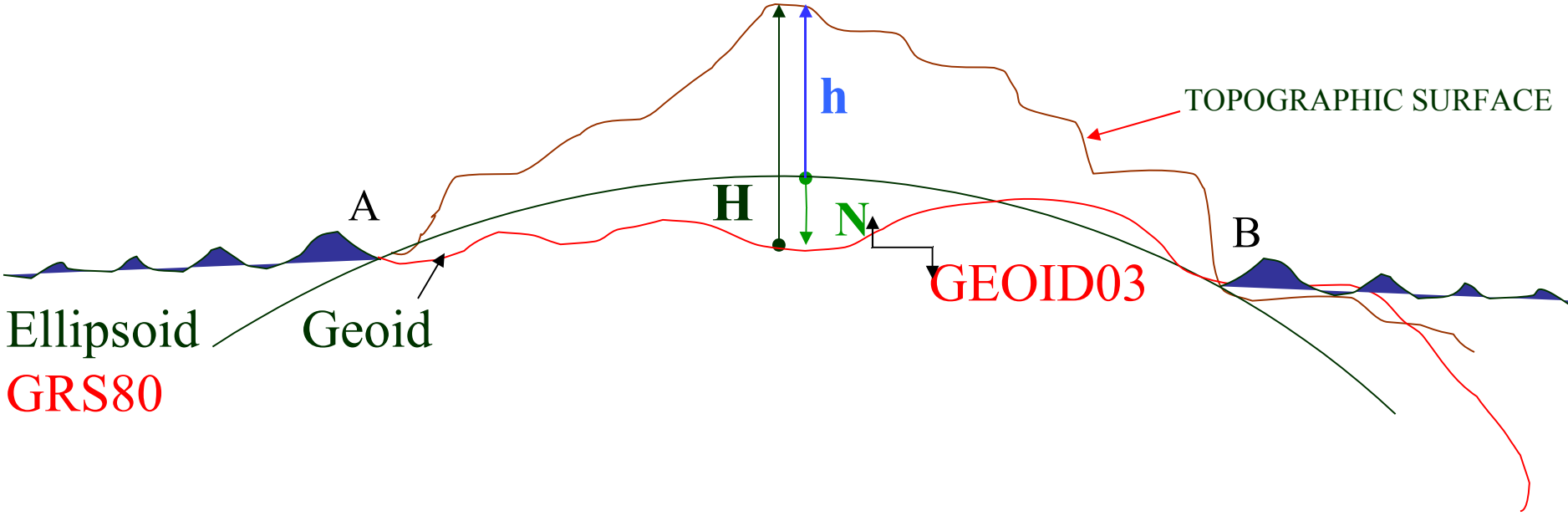
Ellipsoid, Geoid, and Orthometric Heights

H = Orthometric Height (NAVD 88)

h = Ellipsoidal Height (NAD 83)

N = Geoid Height (GEOID 03)

H = h - N



Trigonometry/Geometry

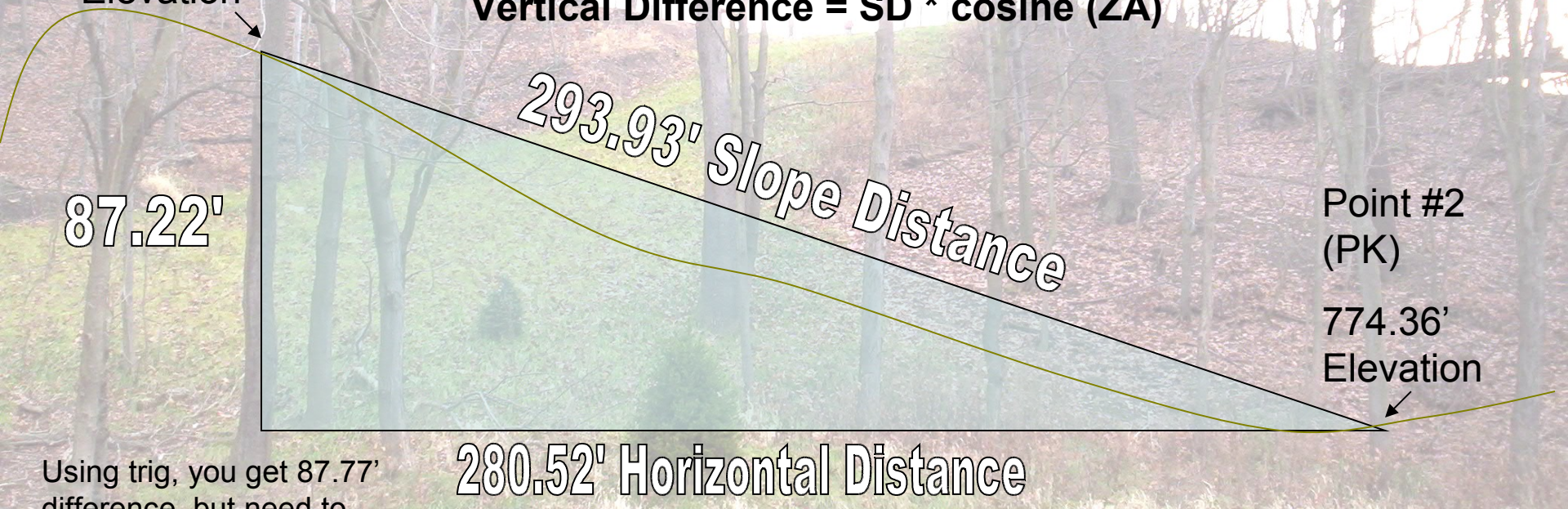
Guyasuta Survey

KNOWN:

Slope Distance: 293.93', Zenith Angle: 72° 37' 35"

Horizontal Distance = SD * sine (ZA)

Vertical Difference = SD * cosine (ZA)



Using trig, you get 87.77' difference, but need to account for the difference in the height of instrument and height of rod (-0.55')

2004/01/13

Guyasuta Traverse:

Closure Error: 0.26’

(3 inches)

Total Distance Traveled: 3,085.08’

Precision = distance/error

??Answer??

1:11,866

Third Order=1:10,000

Second Order=1:50,000

First Order=1:100,000

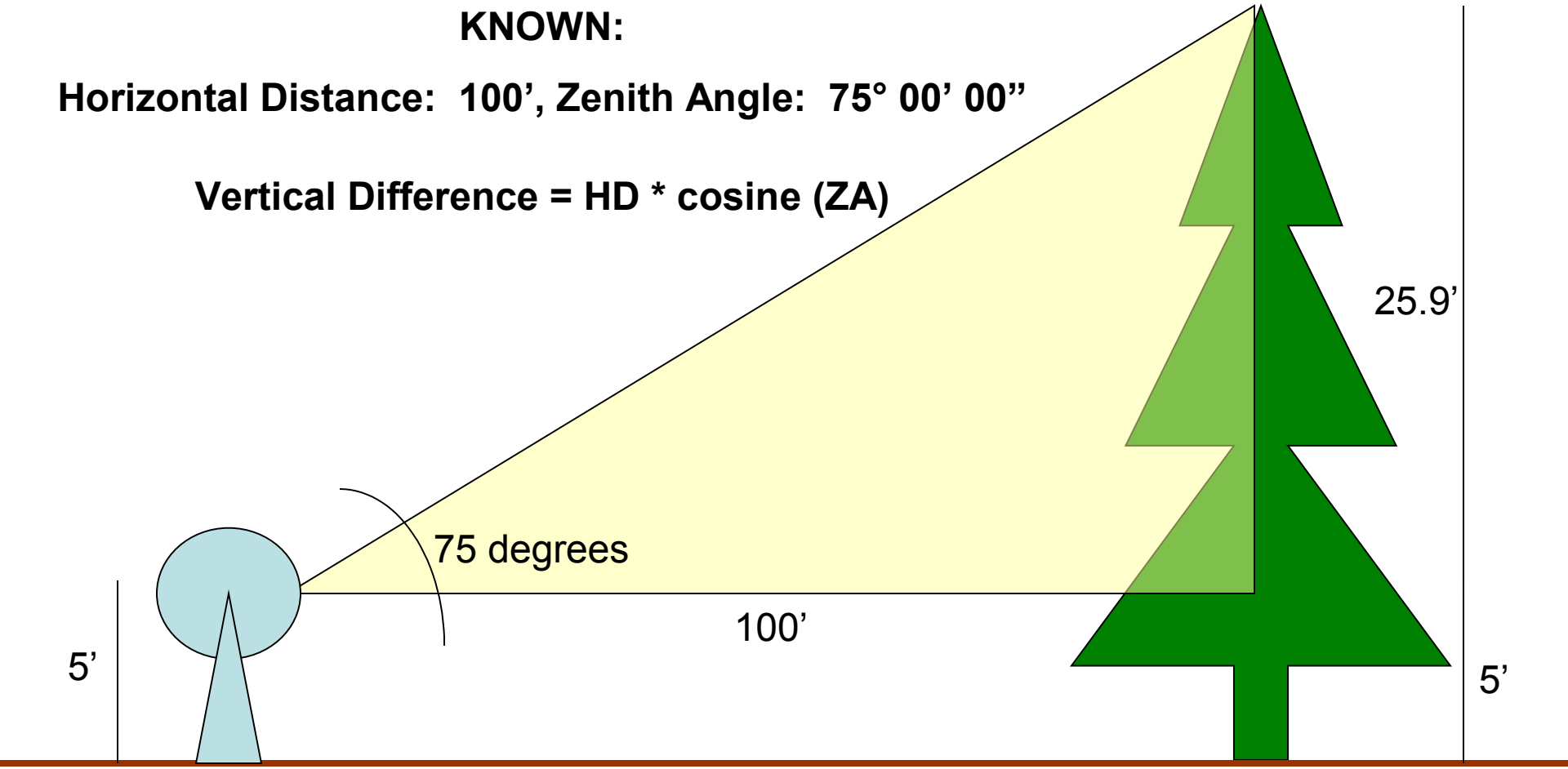

The pin is no where close to where the property line should be!!!!???
Guyasuta Survey
Field Evidence
GUYASUTA
283.8028'
N60°30'28" E
OF TOWNSHIP
BOROUGH
AMERICA

Height of a tall object (indirect measurement)

KNOWN:

Horizontal Distance: 100', Zenith Angle: 75° 00' 00"

Vertical Difference = HD * cosine (ZA)



Height of a tall object (indirect measurement)

KNOWN:

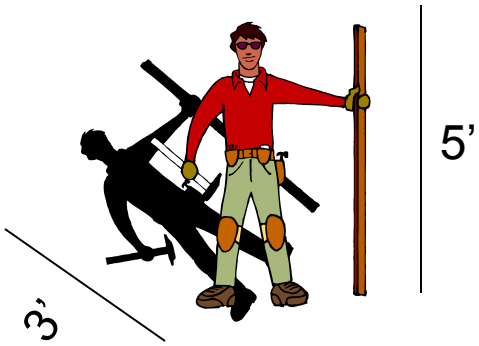
Length of tree shadow, your shadow length, your height

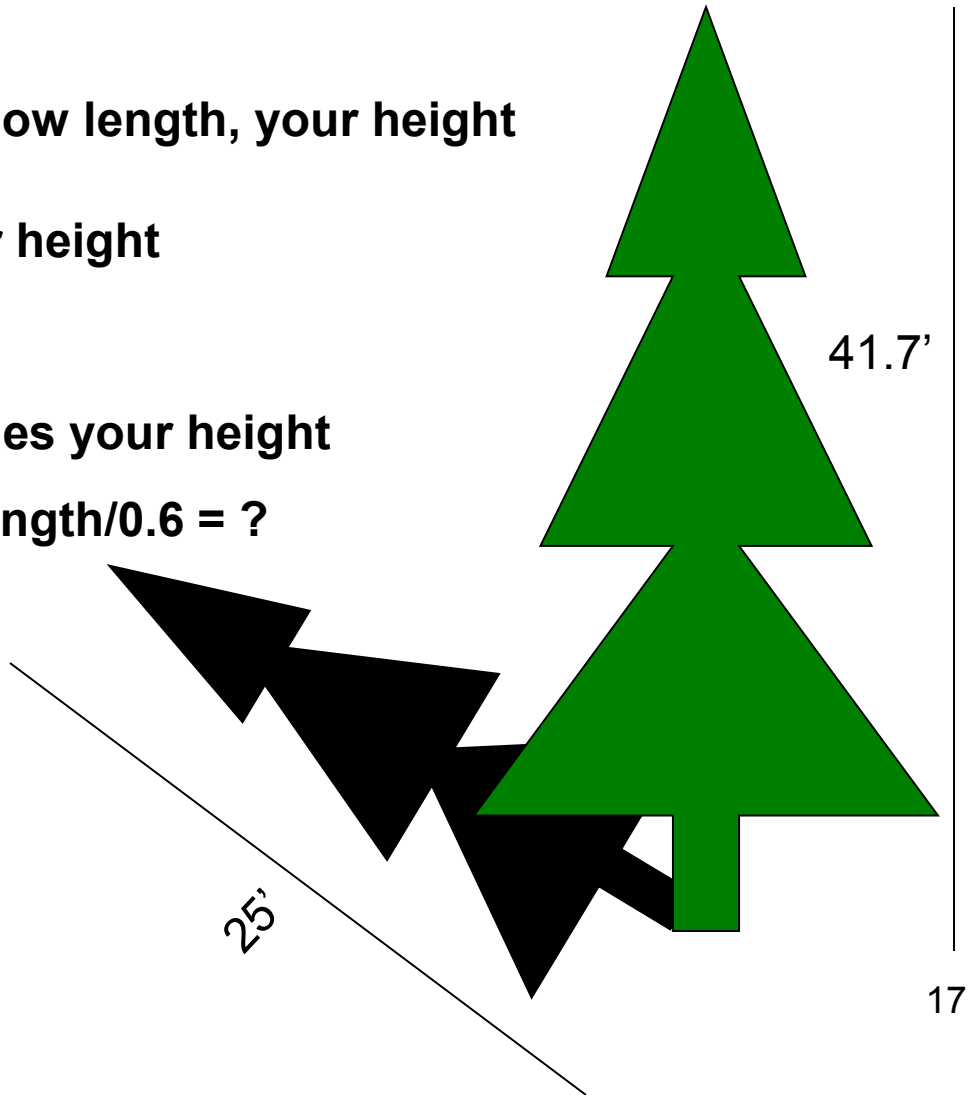
your shadow/your height

3/5=0.6

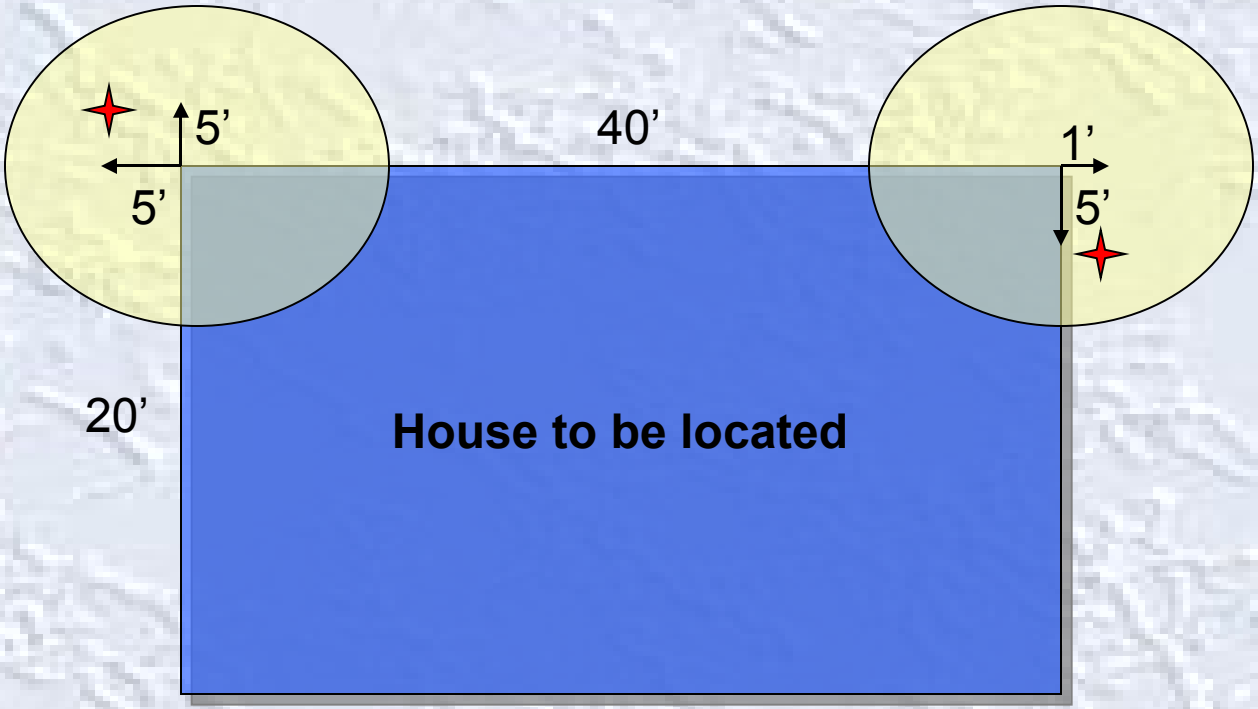
Your shadow is 0.6 times your height

Take tree shadow length/0.6 = ?

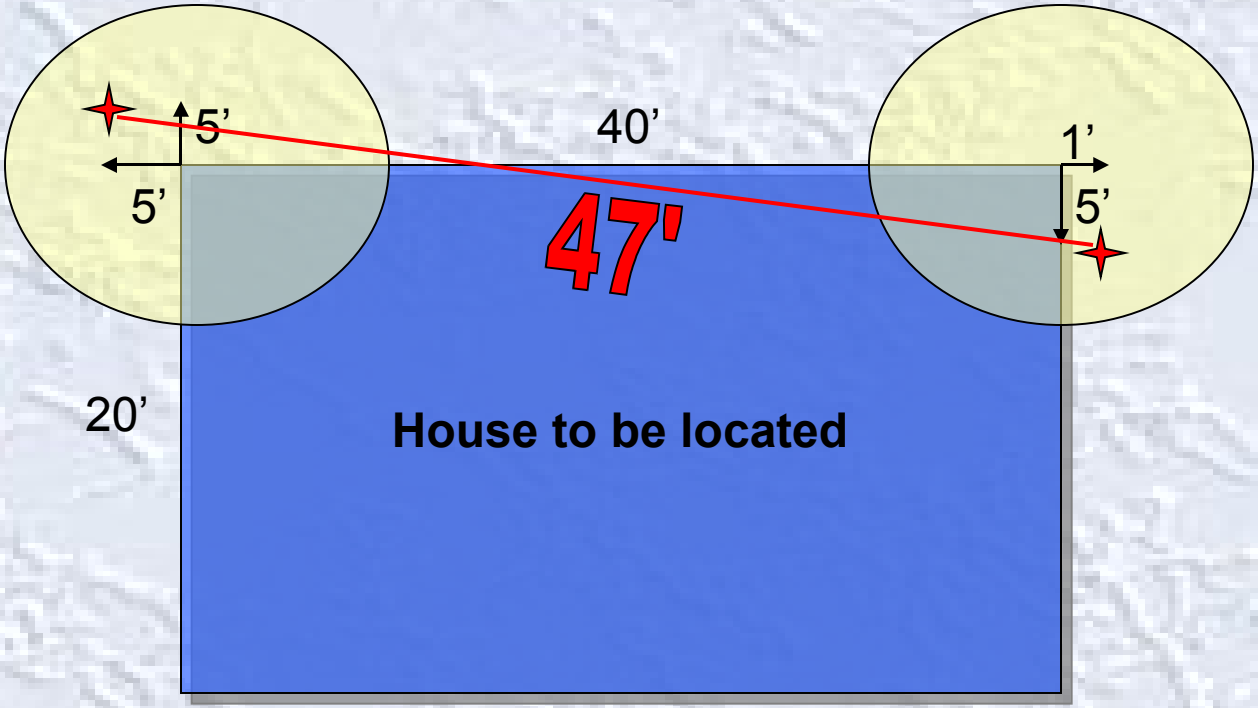




GPS Errors



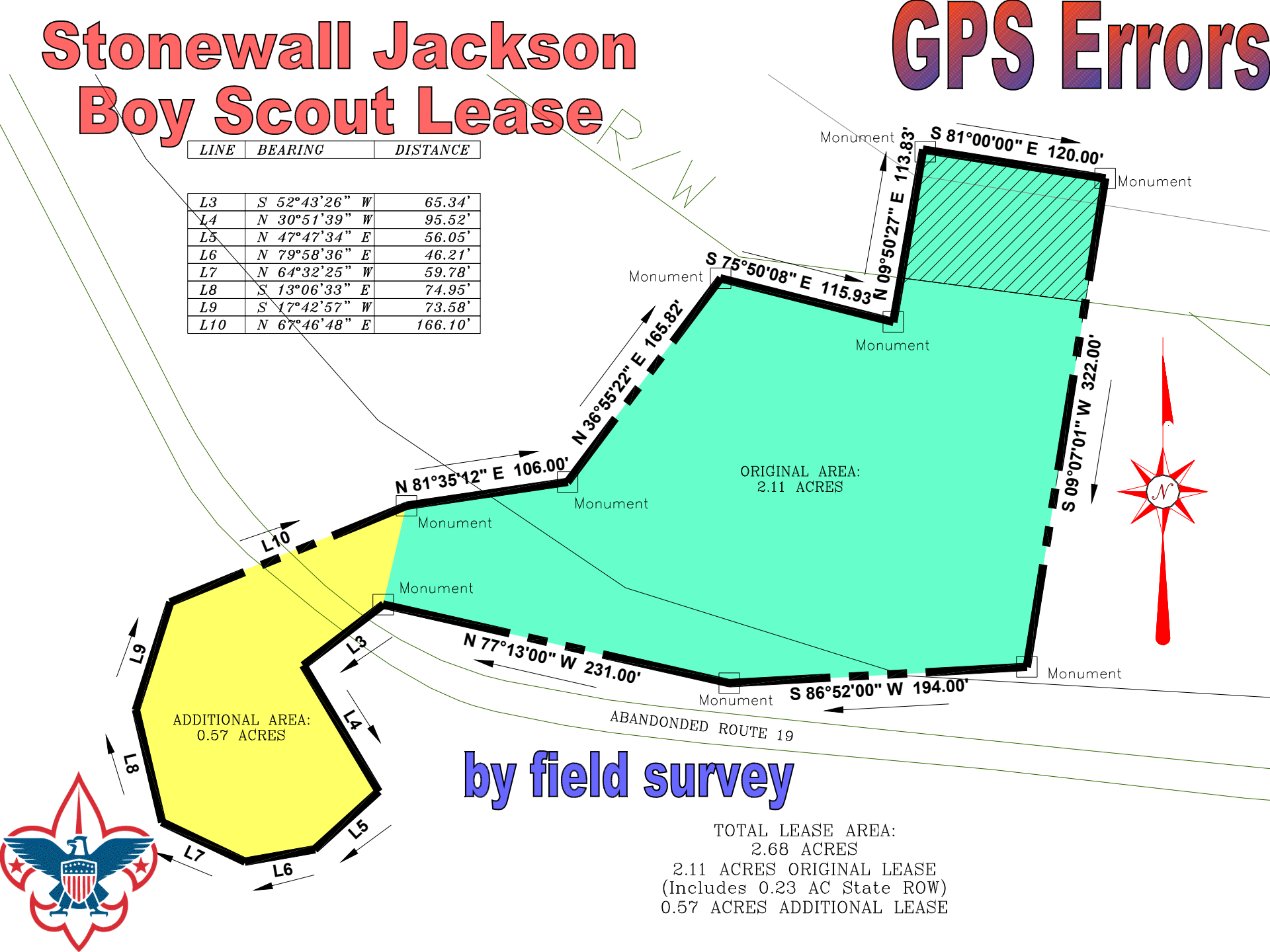
GPS Errors



Stonewall Jackson Boy Scout Lease

GPS Errors

LINE	BEARING	DISTANCE
L3	S 52°43'26" W	65.34'
L4	N 30°51'39" W	95.52'
L5	N 47°47'34" E	56.05'
L6	N 79°58'36" E	46.21'
L7	N 64°32'25" W	59.78'
L8	S 13°06'33" E	74.95'
L9	S 17°42'57" W	73.58'
L10	N 67°46'48" E	166.10'



by field survey

TOTAL LEASE AREA:
2.68 ACRES
2.11 ACRES ORIGINAL LEASE
(Includes 0.23 AC State ROW)
0.57 ACRES ADDITIONAL LEASE

Stonewall Jackson Boy Scout Lease

GPS Errors

LINE	BEARING	DISTANCE
L3	S 52°43'26" W	65.34'
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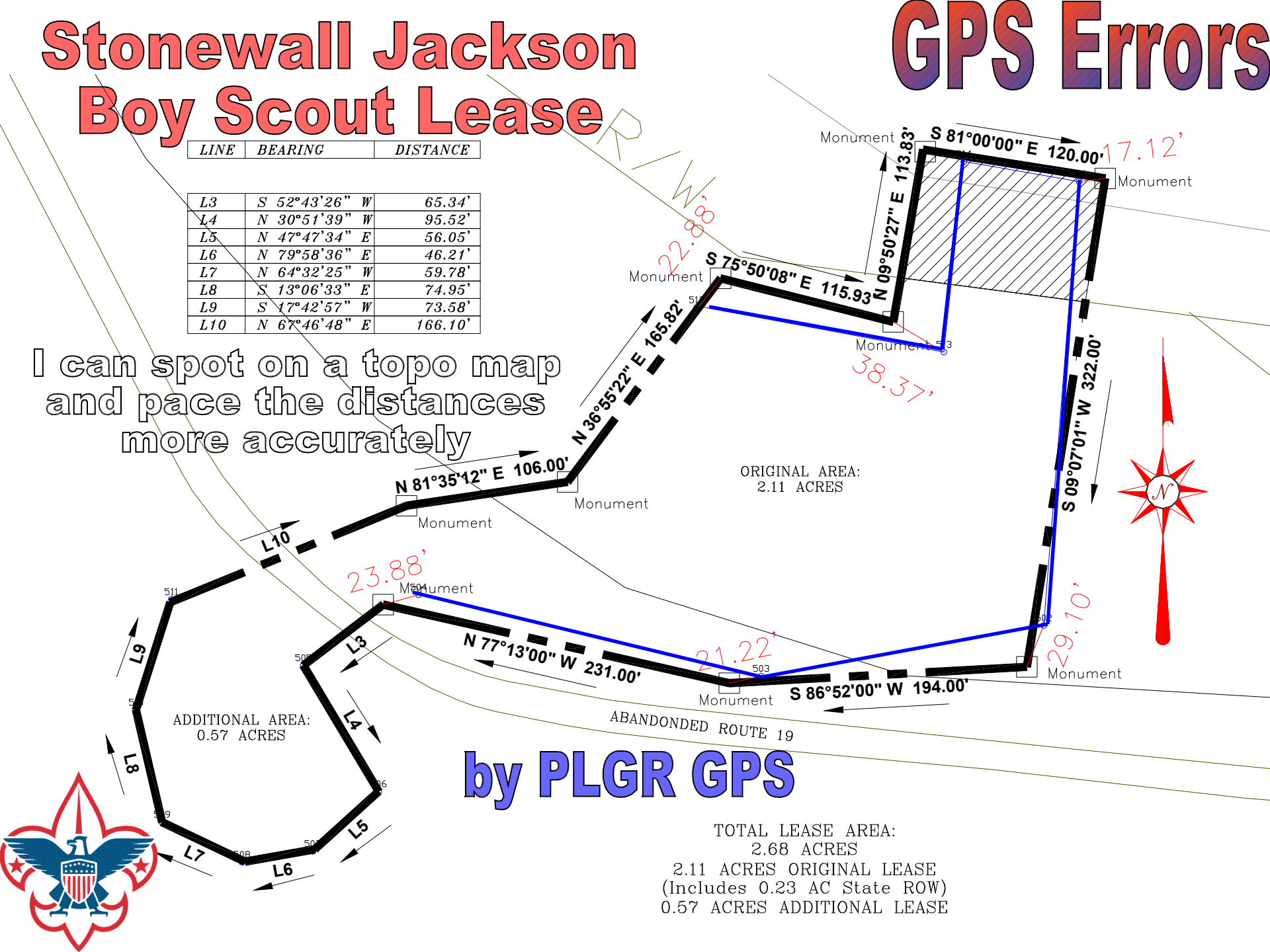
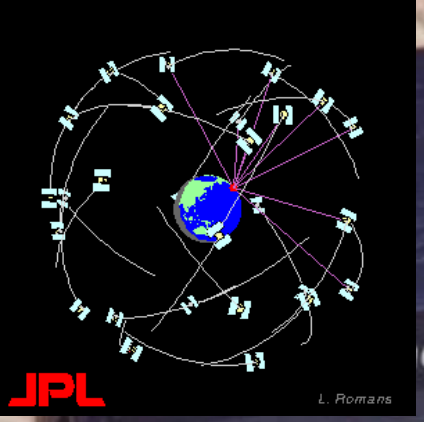
L10	N 67°46'48" E	166.10'

I can spot on a topo map and pace the distances more accurately



by PLGR GPS

TOTAL LEASE AREA:
2.68 ACRES
2.11 ACRES ORIGINAL LEASE
(Includes 0.23 AC State ROW)
0.57 ACRES ADDITIONAL LEASE



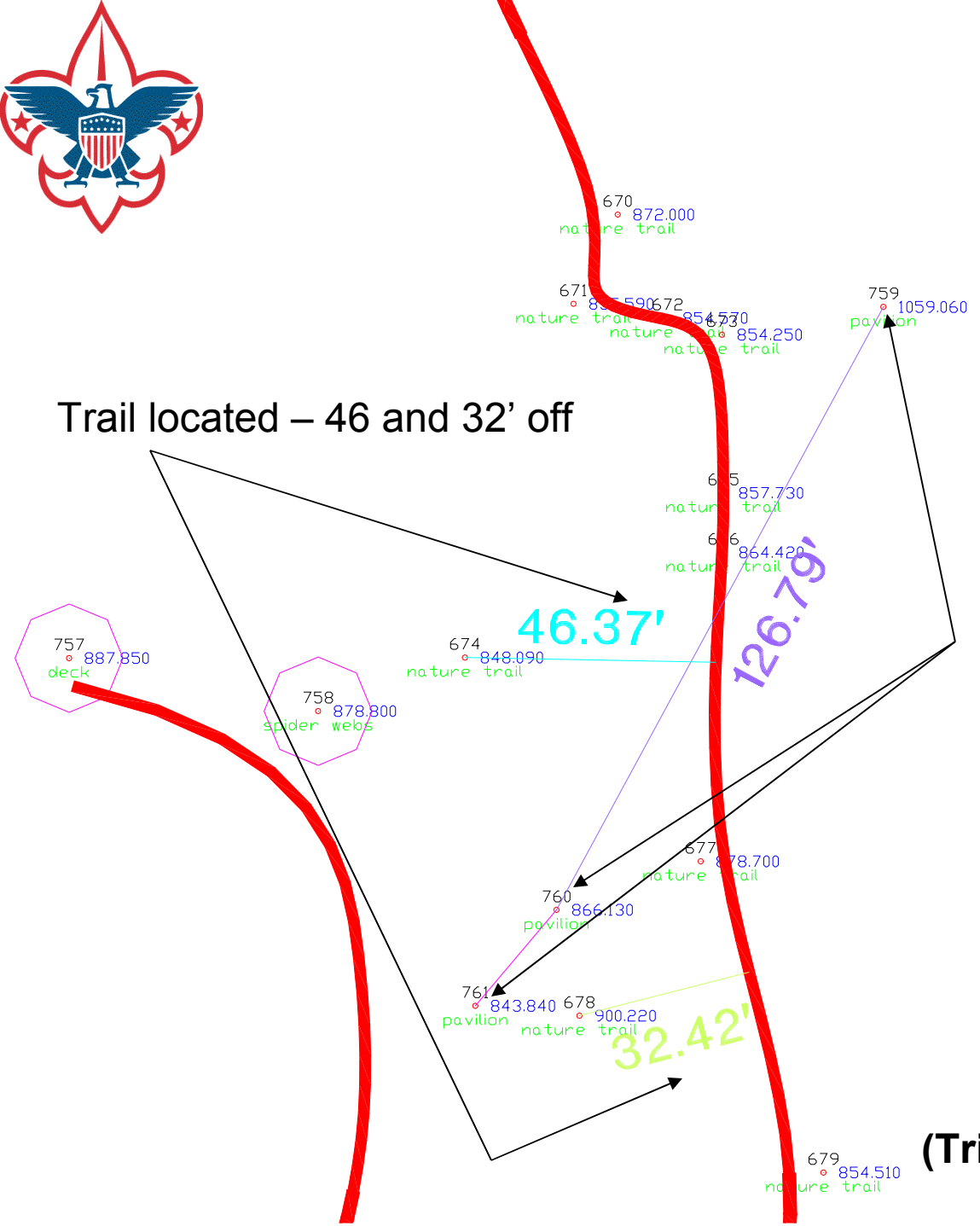
The accuracy of a GPS position reading is often expressed in terms of the Root Mean Square statistic (1-RMS). This is the radius of the circle containing 68 percent of the individual measurements being made. In other words, with a 1-RMS of 100 feet, 68% of the positions collected will lie within 100 feet of the intended location, and 32% will be located farther than 100 feet.

GPS Errors

PDOP (shown as number 1-10)

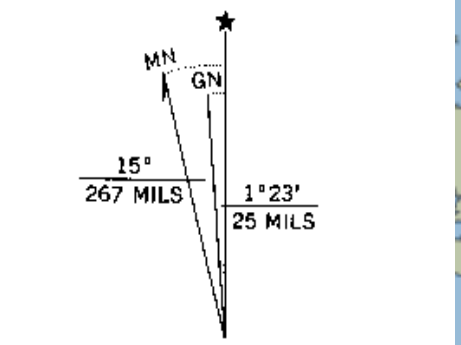
PDOP (shown as accuracy in feet)

GPS Errors

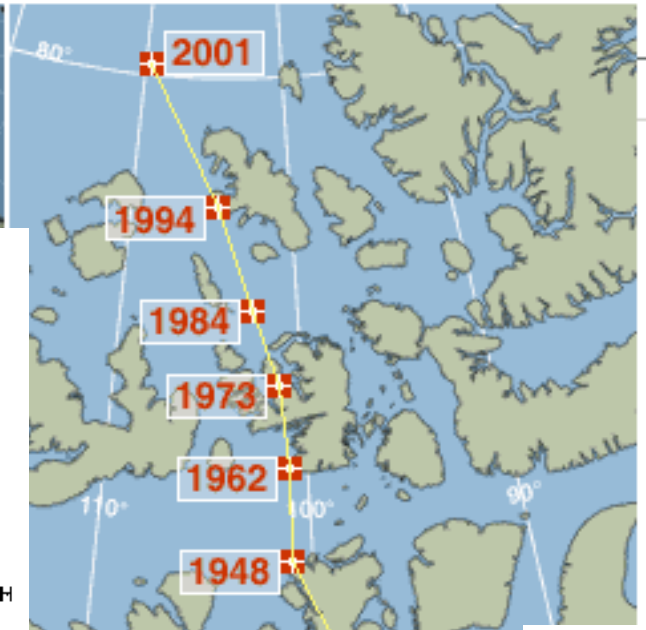


3 points shot on pavilion… all good PDOP. Why one 127' away? (Note elevation of 1059 compared with others adjacent at 850-889')

Boy Scouts Camp Guyasuta (Trimble GeoXT) – Typ. 3' accuracy



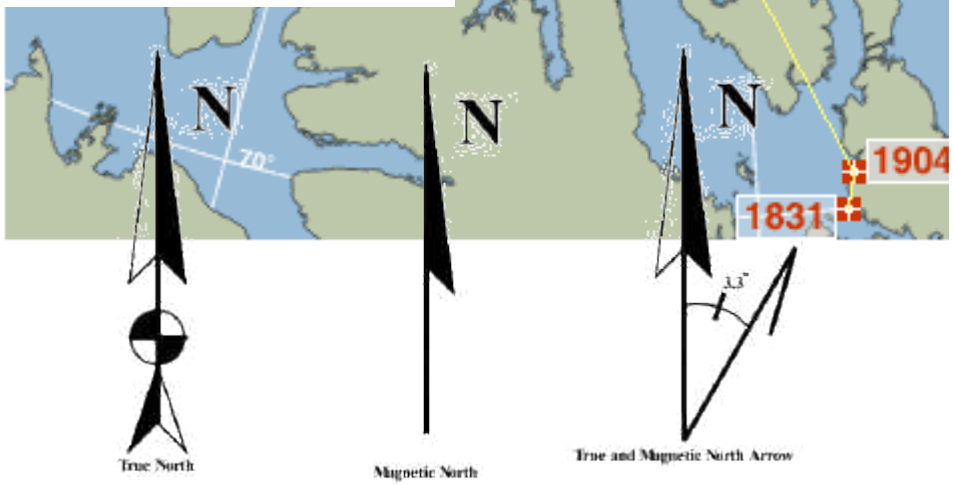
UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

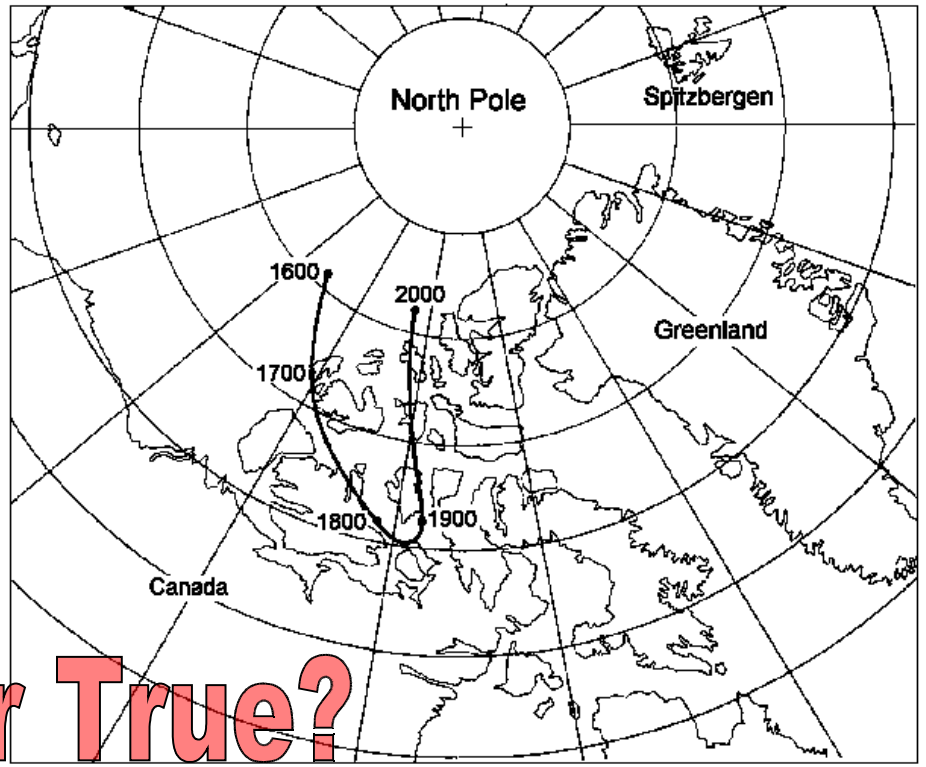


Wandering Pole

Position of North Magnetic Pole by year

While the North Magnetic Pole often skips around many miles each day in an oval loop, on average it migrates from 6 to 25 miles (10 to 40 km) each year to the north/northwest. The points on the map of the Canadian Arctic depict where explorers have plotted the migrating pole for almost two centuries, including Norwegian Roald Amundsen in 1904.





North is North?

Grid, Magnetic, or True?

GIS (Get It Surveyed)

Majority of input data has been 'rubbersheeted' (stretched in either x, y, or both to fit all errors) – losing it's integrity. Especially deeds and parcels.

Unless metadata kept up – most points have no accuracy… they may be field surveyed accurately, spotted on (guessed), or done with a GPS with 10m accuracy.

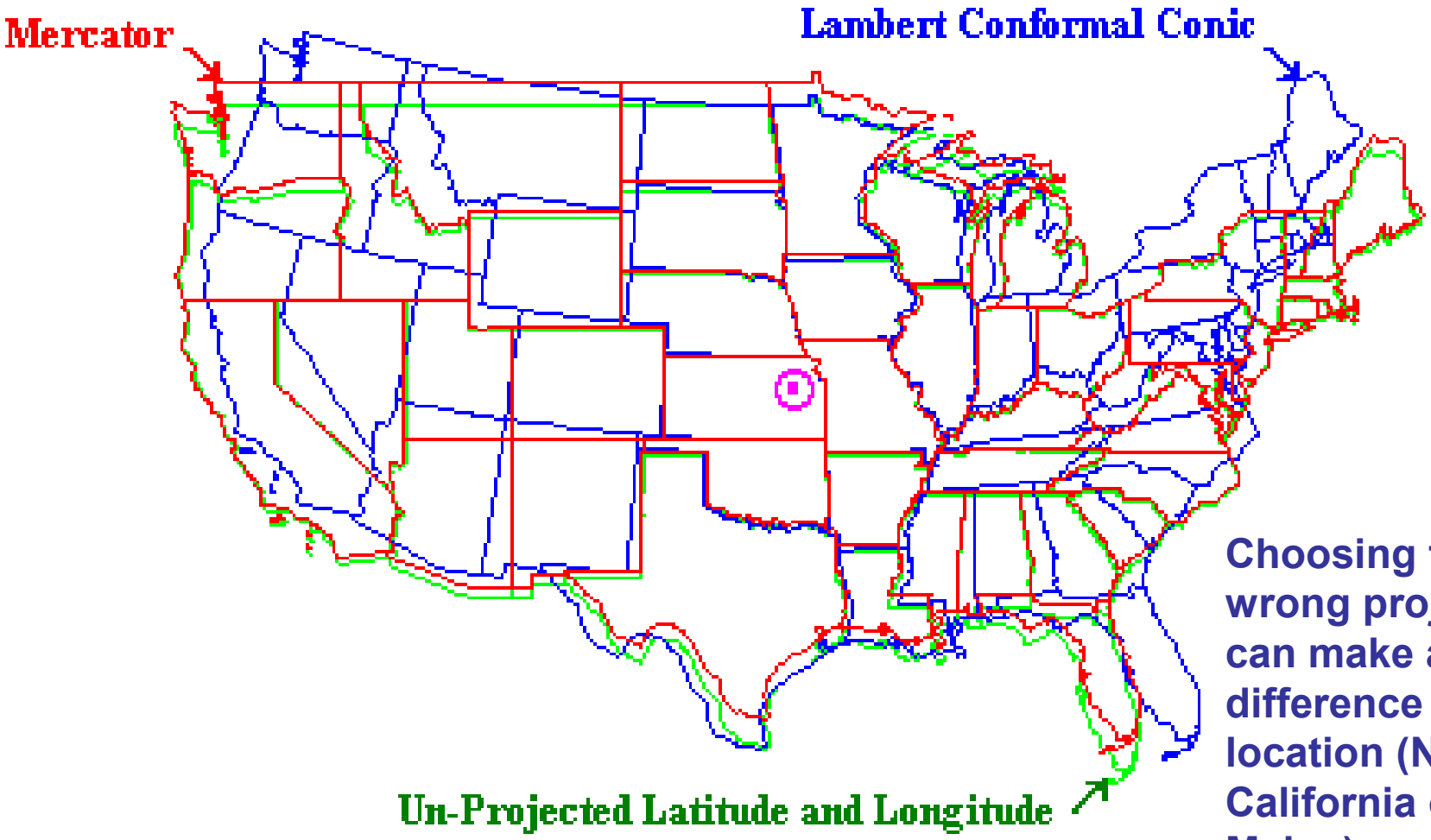
Ali Al Salem example (one survey grade GPS receiver with no base station for differential corrections – all of base buildings off by 0-30')

Aviano example (no checks into base control monuments, no idea of accuracy, movement of base station with no ones knowledge – import it all into GIS for a nice looking (but very inaccurate) map.

Tyndall example (given coordinates to stake where a berm is to be constructed. When first turned PLGR on – it gave me coordinates, distance and bearing – but the accuracy was >1 mile! After letting it gather almanac and more satellites, was able to navigate to the approximate area (where they were already working)).

GIS (Datums)

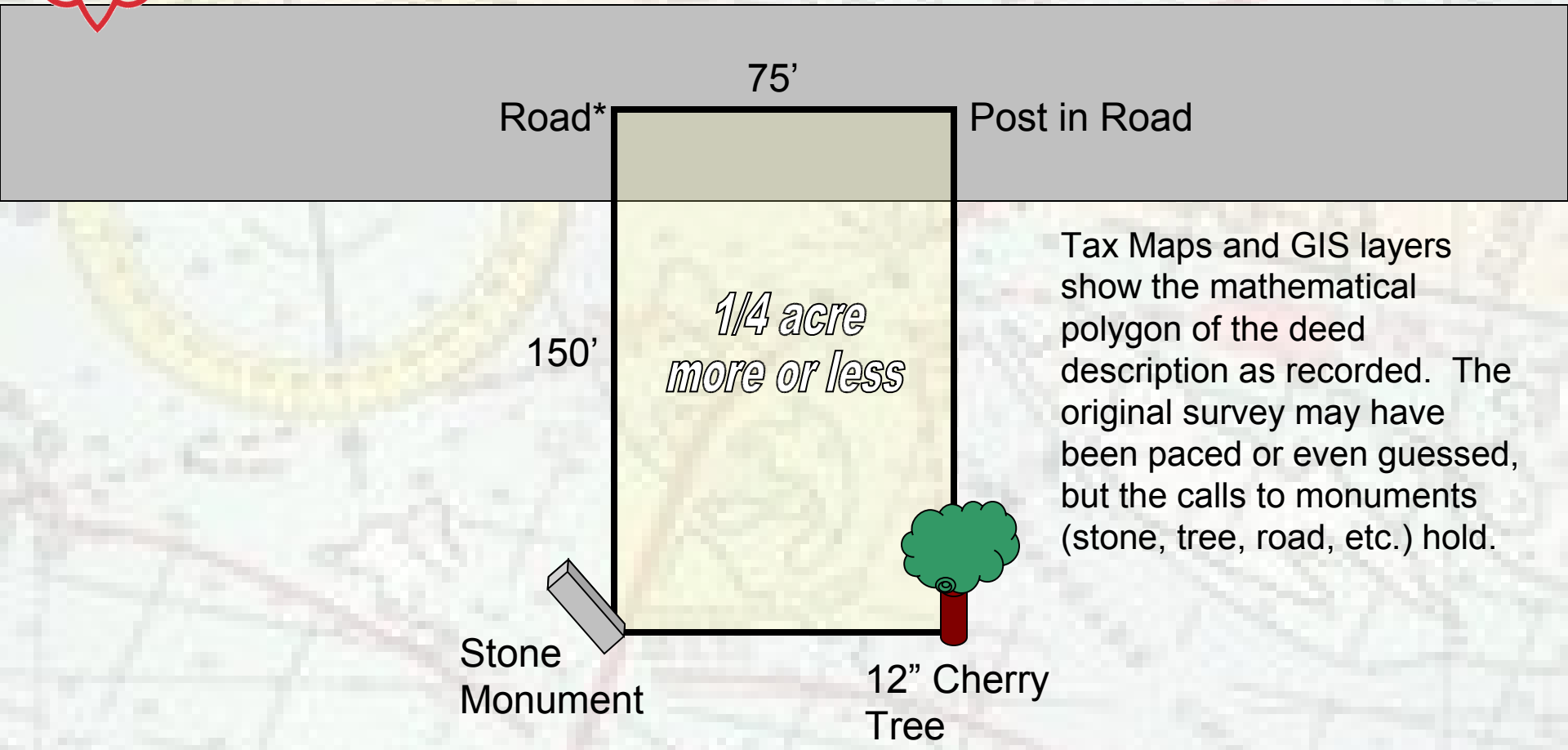
Three Map Projections Centered at 39 N and 96 W



Choosing the wrong projection can make a HUGE difference in location (Note California or Maine)

Using two different Datums:

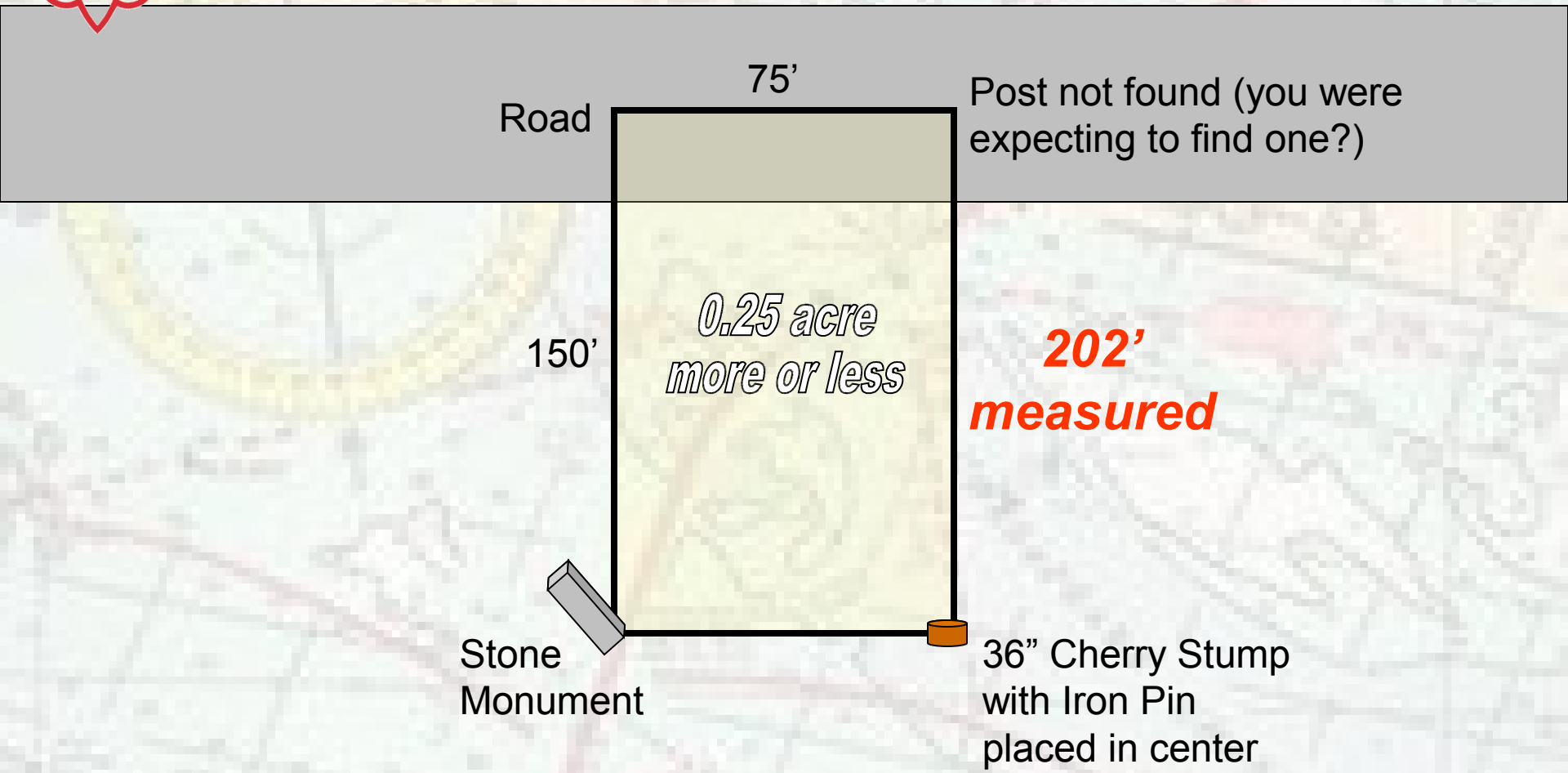
Plotting a Deed



Tax Maps and GIS layers show the mathematical polygon of the deed description as recorded. The original survey may have been paced or even guessed, but the calls to monuments (stone, tree, road, etc.) hold.

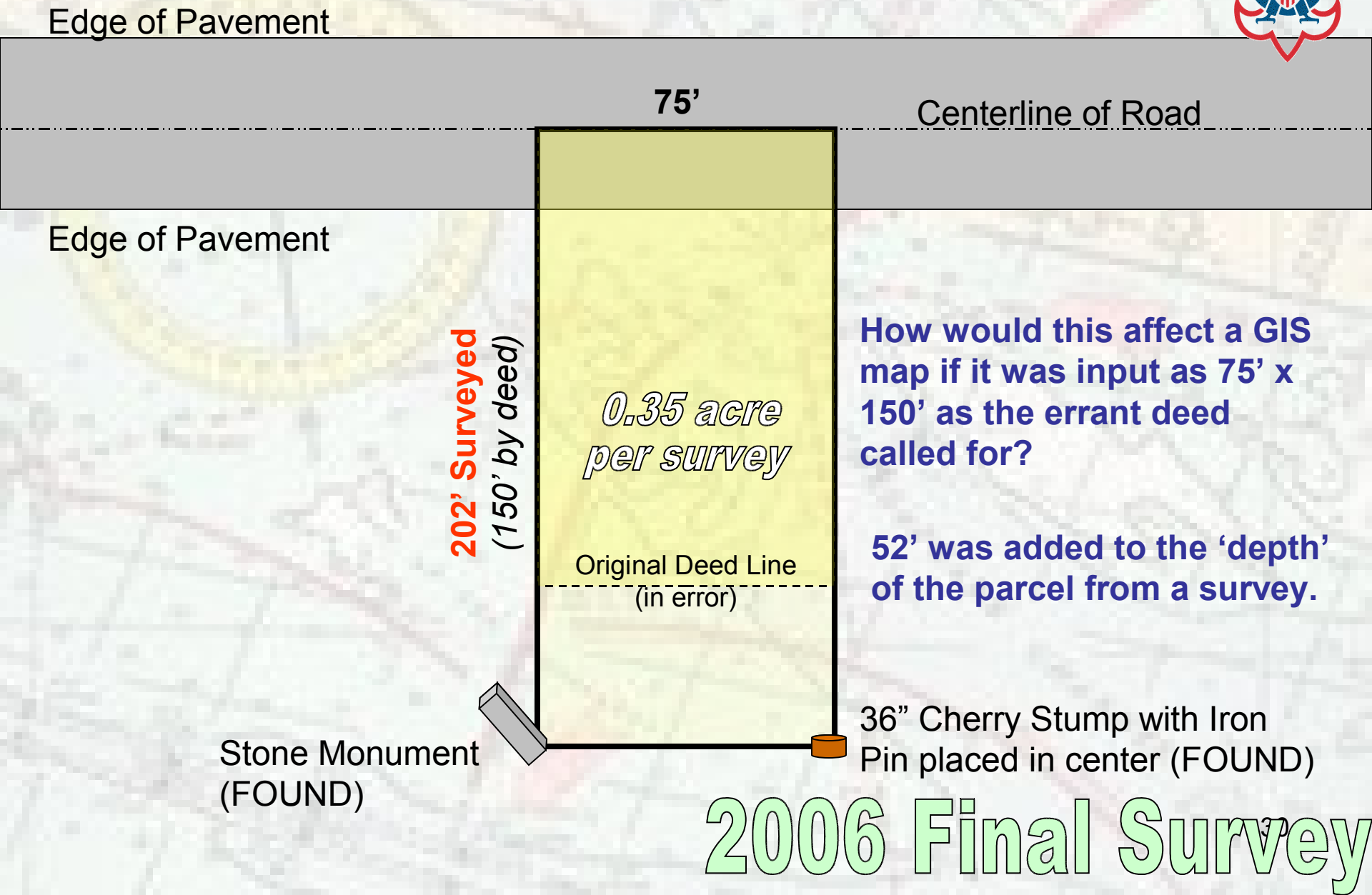
* Call in deed just for “road” – does it mean centerline, edge of road pavement, or edge of right of way?

Plotting a Deed



2006 Field Survey

Plotting a Deed



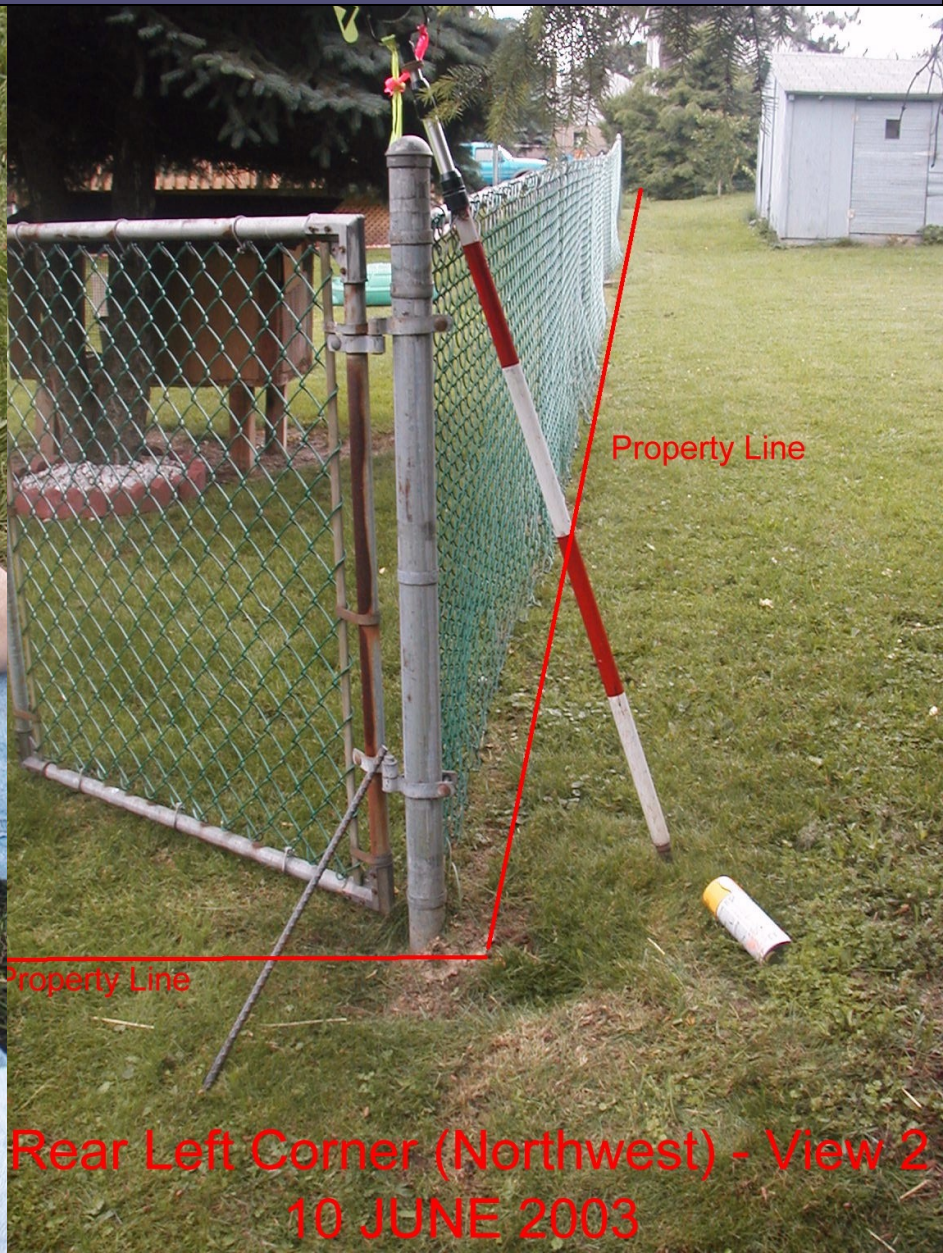
How would this affect a GIS map if it was input as 75’ x 150’ as the errant deed called for?

52’ was added to the ‘depth’ of the parcel from a survey.

2006 Final Survey

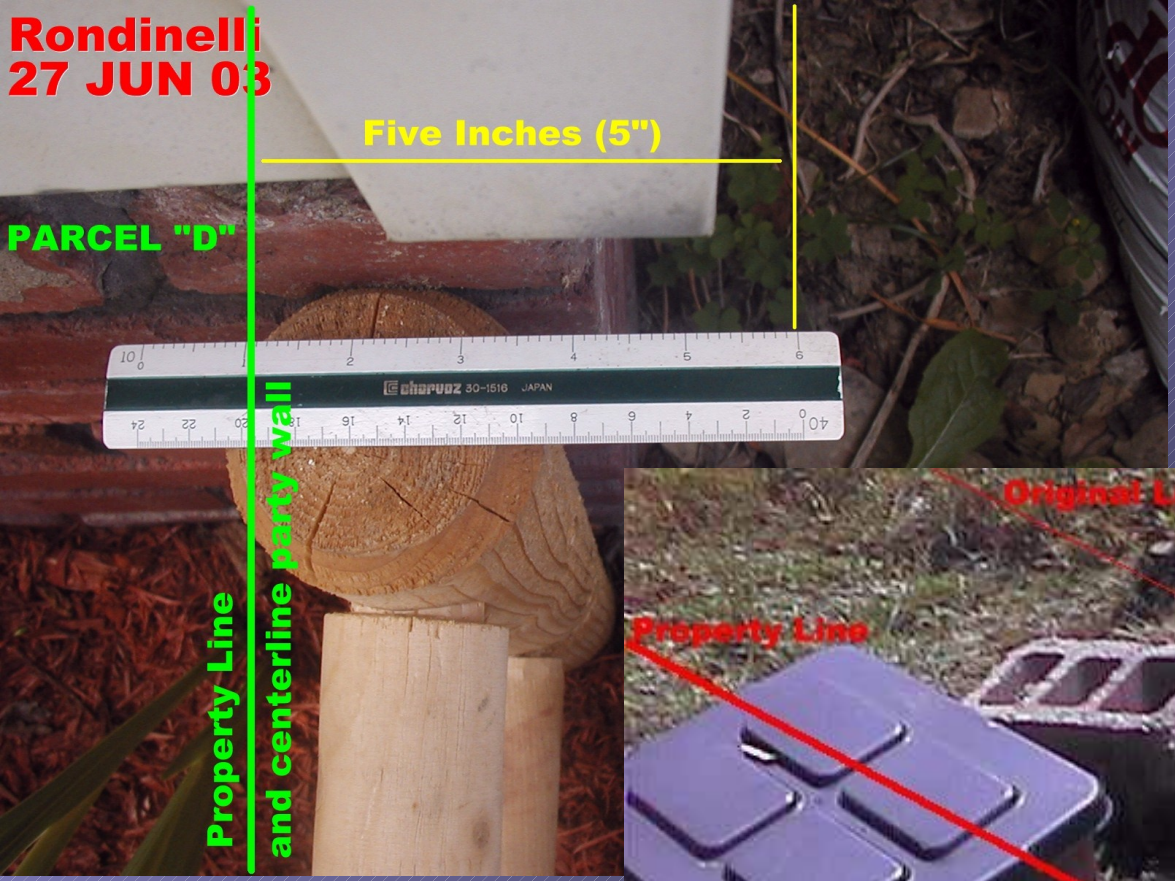
Survey Details

Rear Left Corner (Northwest)
10 JUNE 2003



Rear Left Corner (Northwest) - View 2
10 JUNE 2003

Survey Details

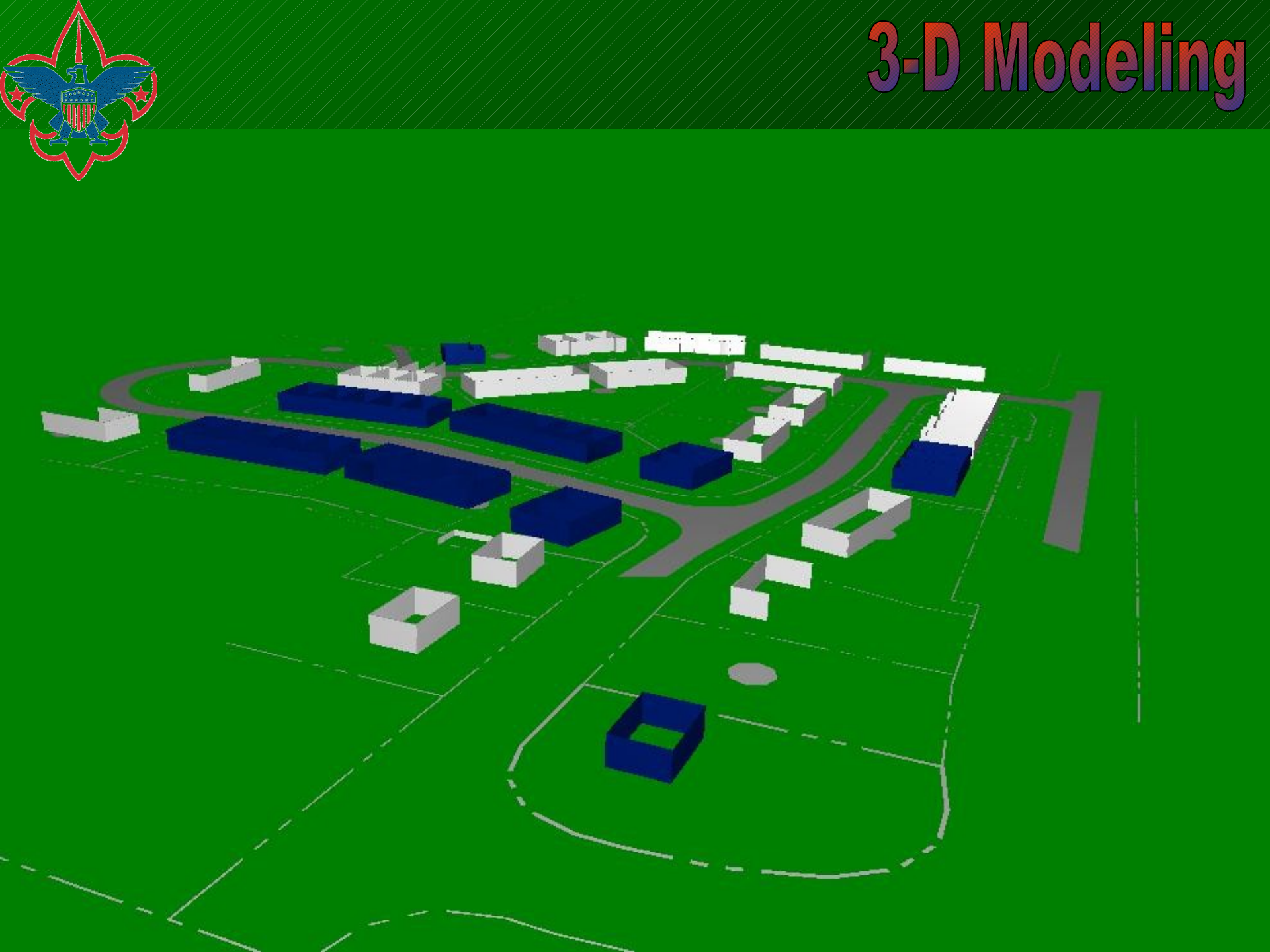


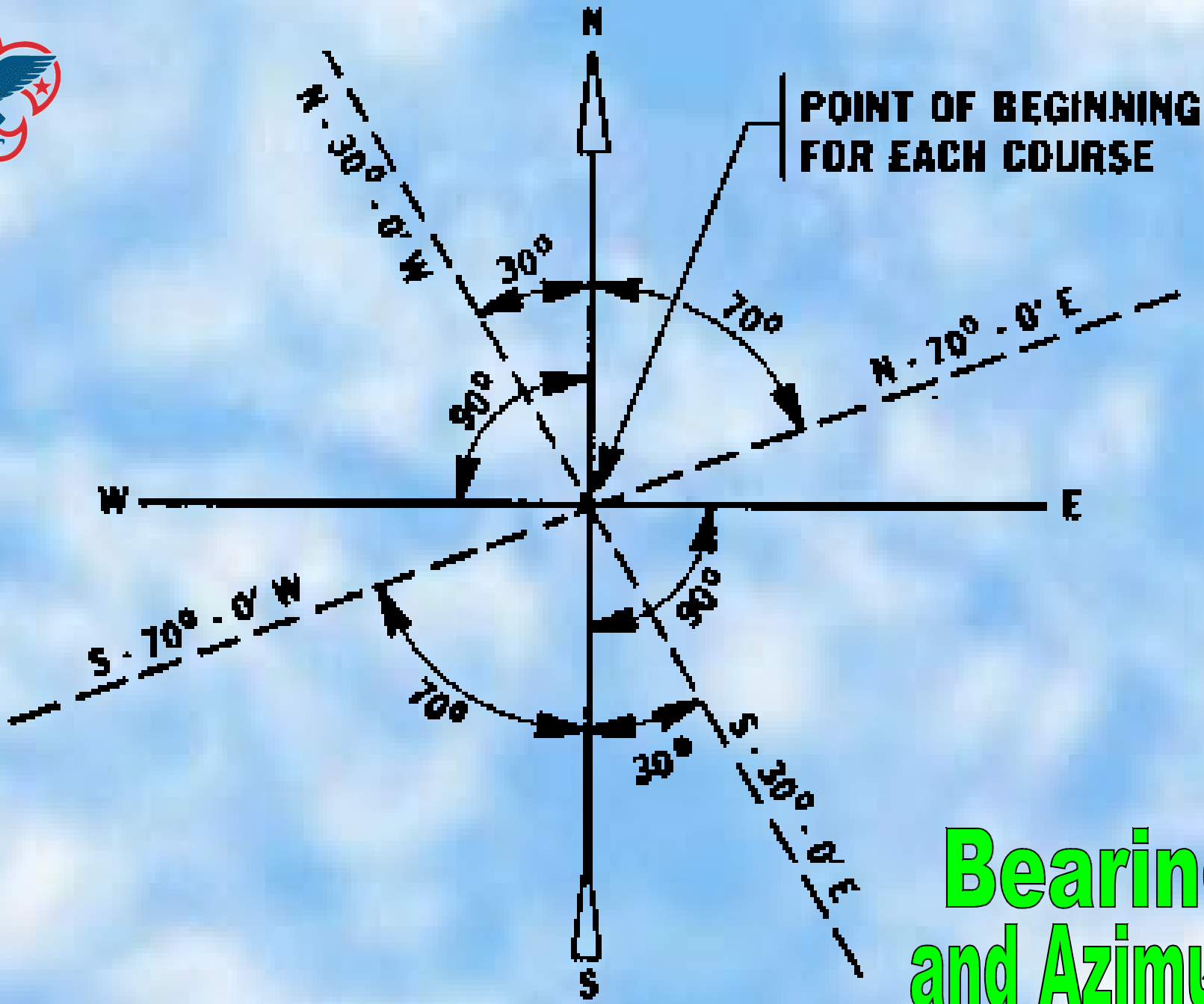

Original Photo
SPEED
LIMIT
15


Option 1
SPEED
LIMIT
15


Option 2
SPEED
LIMIT
15

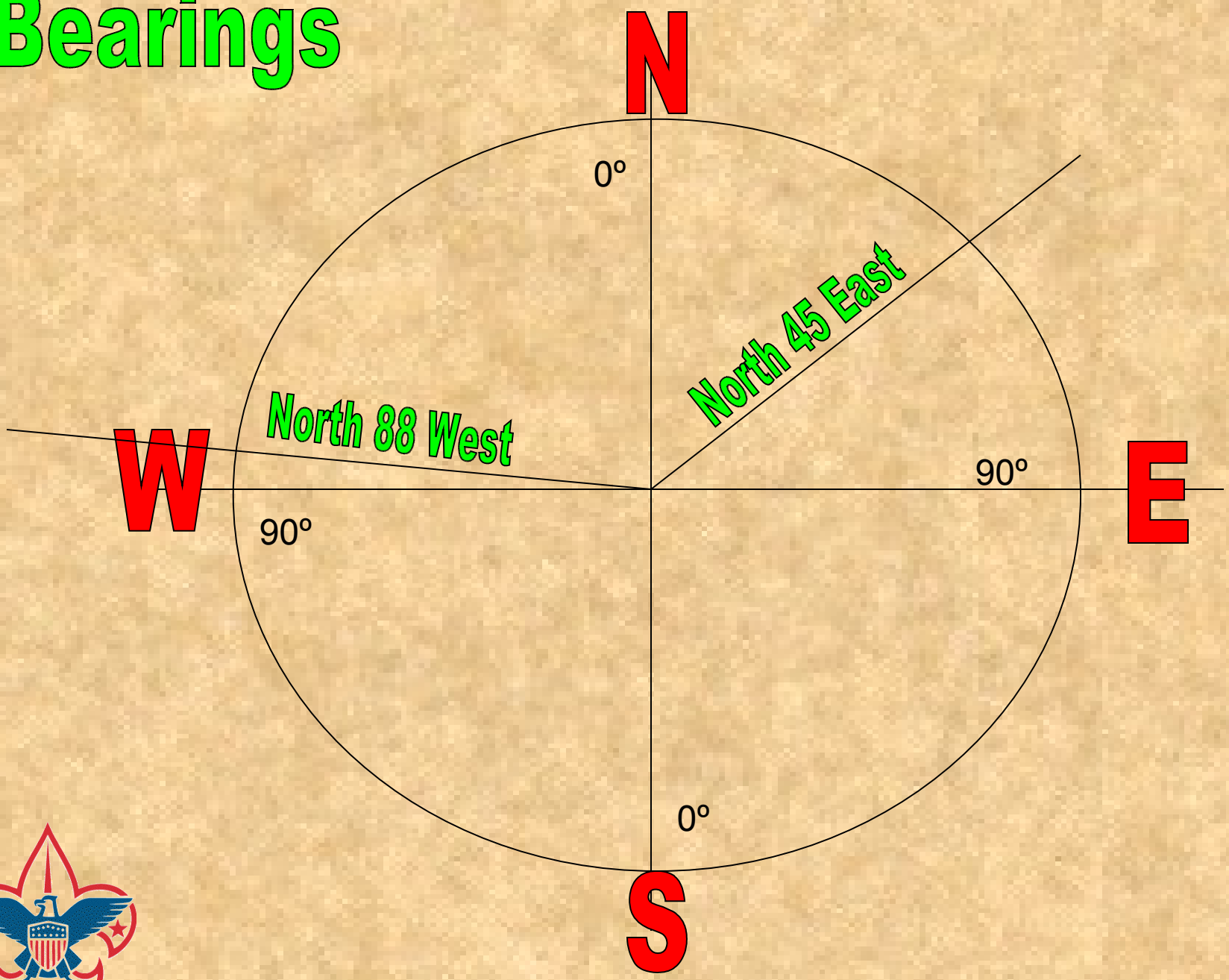
3-D Modeling



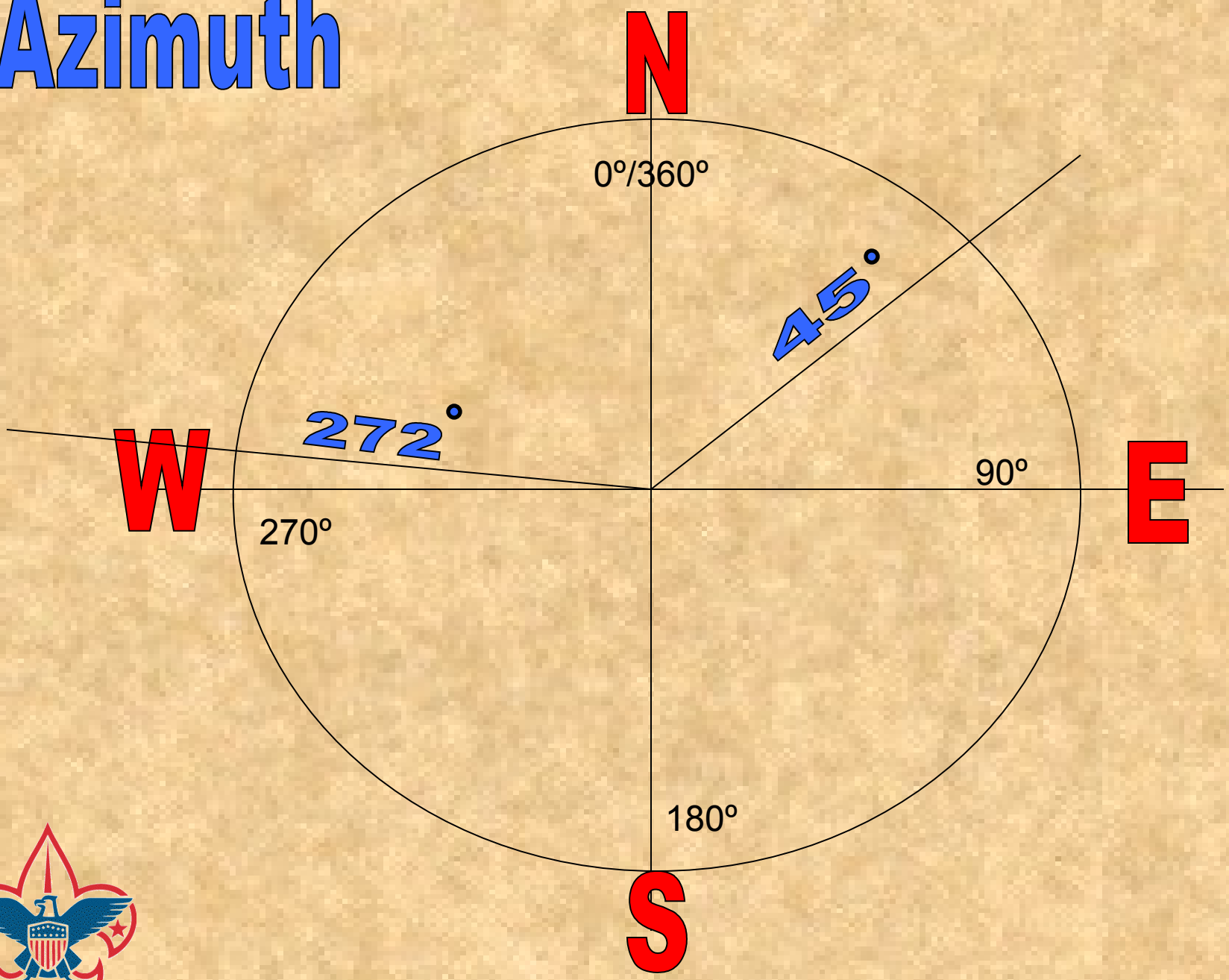


Bearings and Azimuth

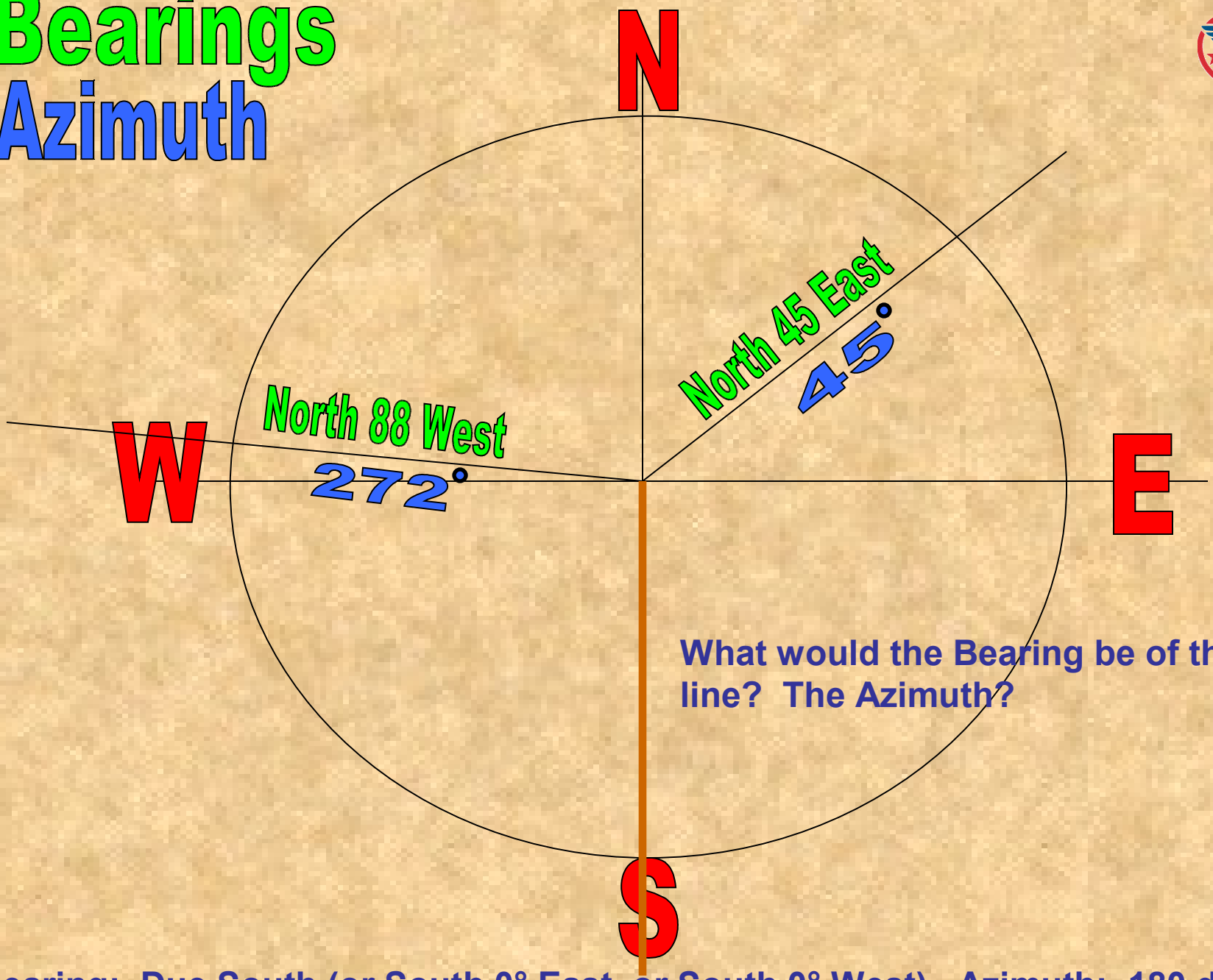
Bearings



Azimuth



Bearings
Azimuth



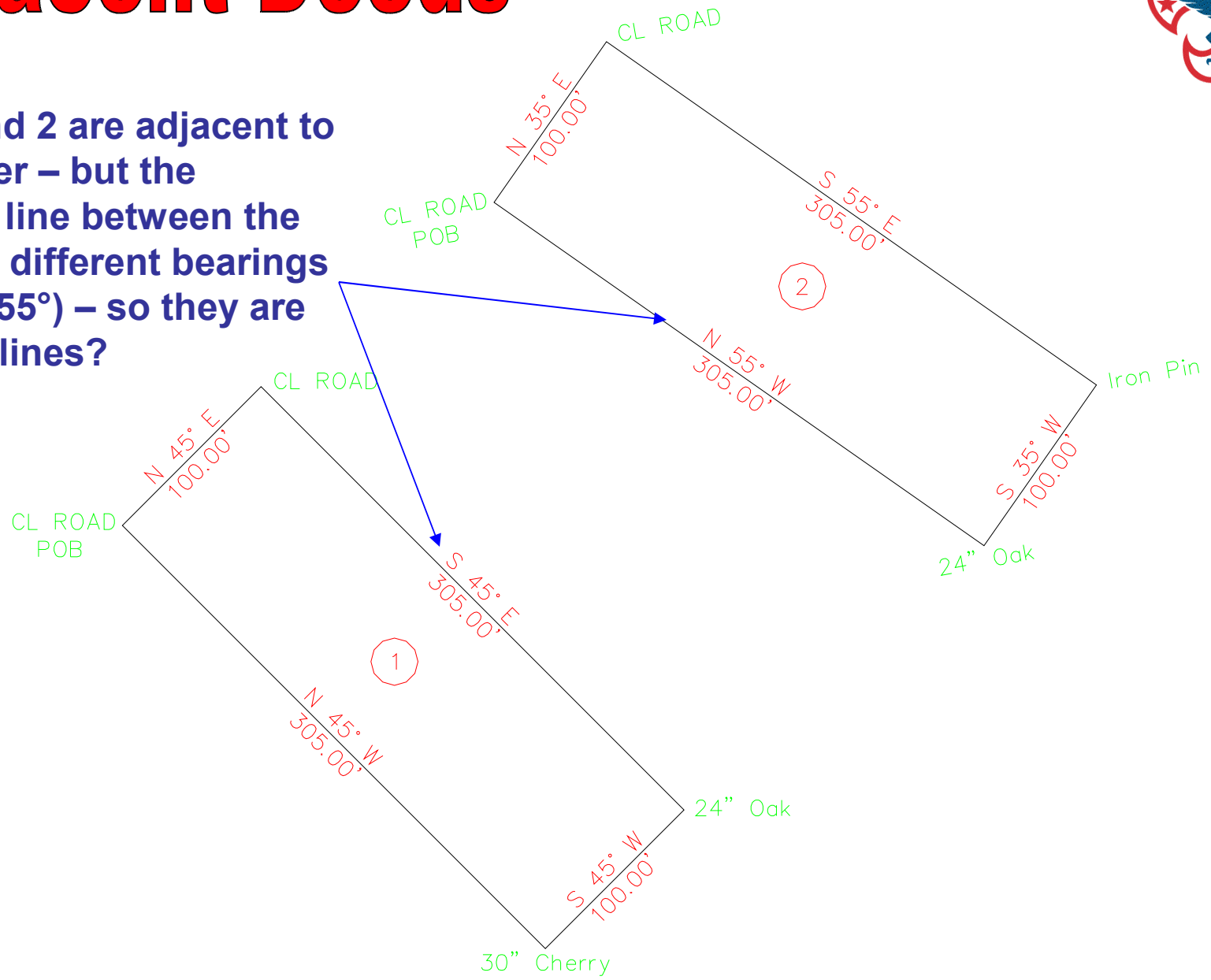
What would the Bearing be of this line? The Azimuth?

Bearing: Due South (or South 0° East, or South 0° West) Azimuth: 180 degrees

How many feet in a mile?	5,280 feet
How many square feet in an acre?	43,560 square feet
How many feet in a rod/perch?	16.5 feet

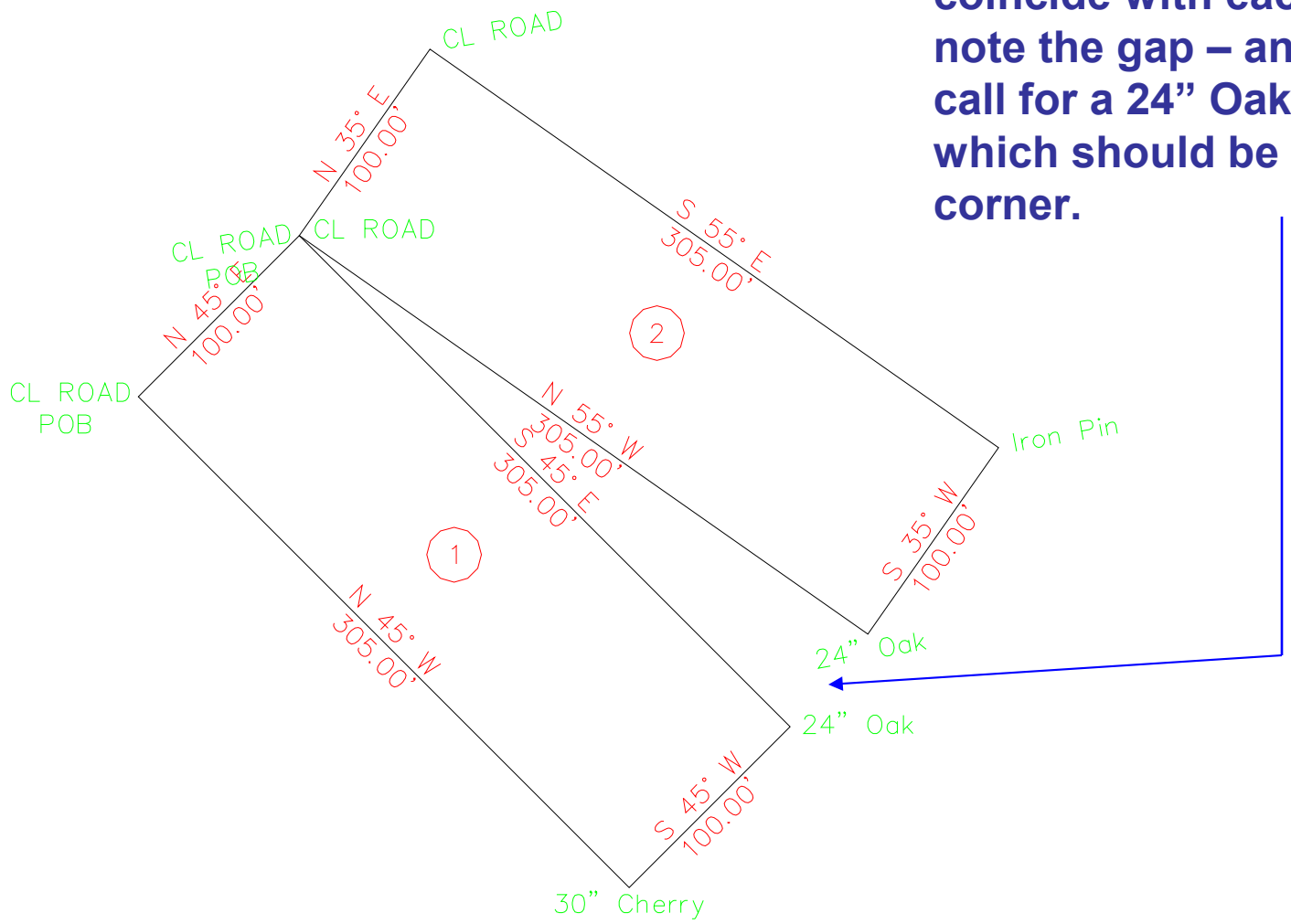
Adjacent Deeds

Lots 1 and 2 are adjacent to each other – but the common line between the two have different bearings (45° and 55°) – so they are different lines?

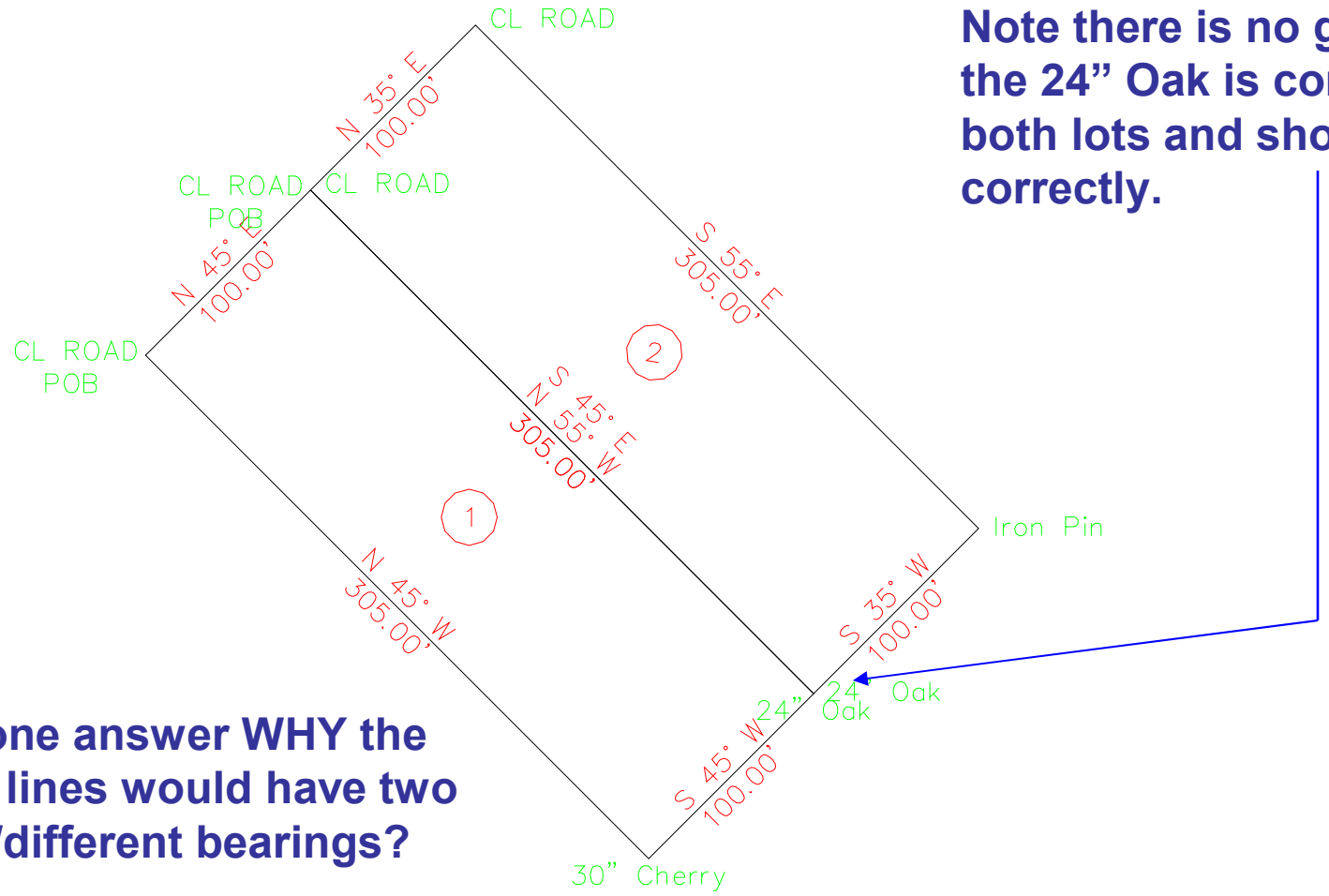


Adjacent Deeds

Lots 1 and 2 common corner on the road moved to coincide with each other – note the gap – and also the call for a 24” Oak tree – which should be the same corner.



Adjacent Deeds

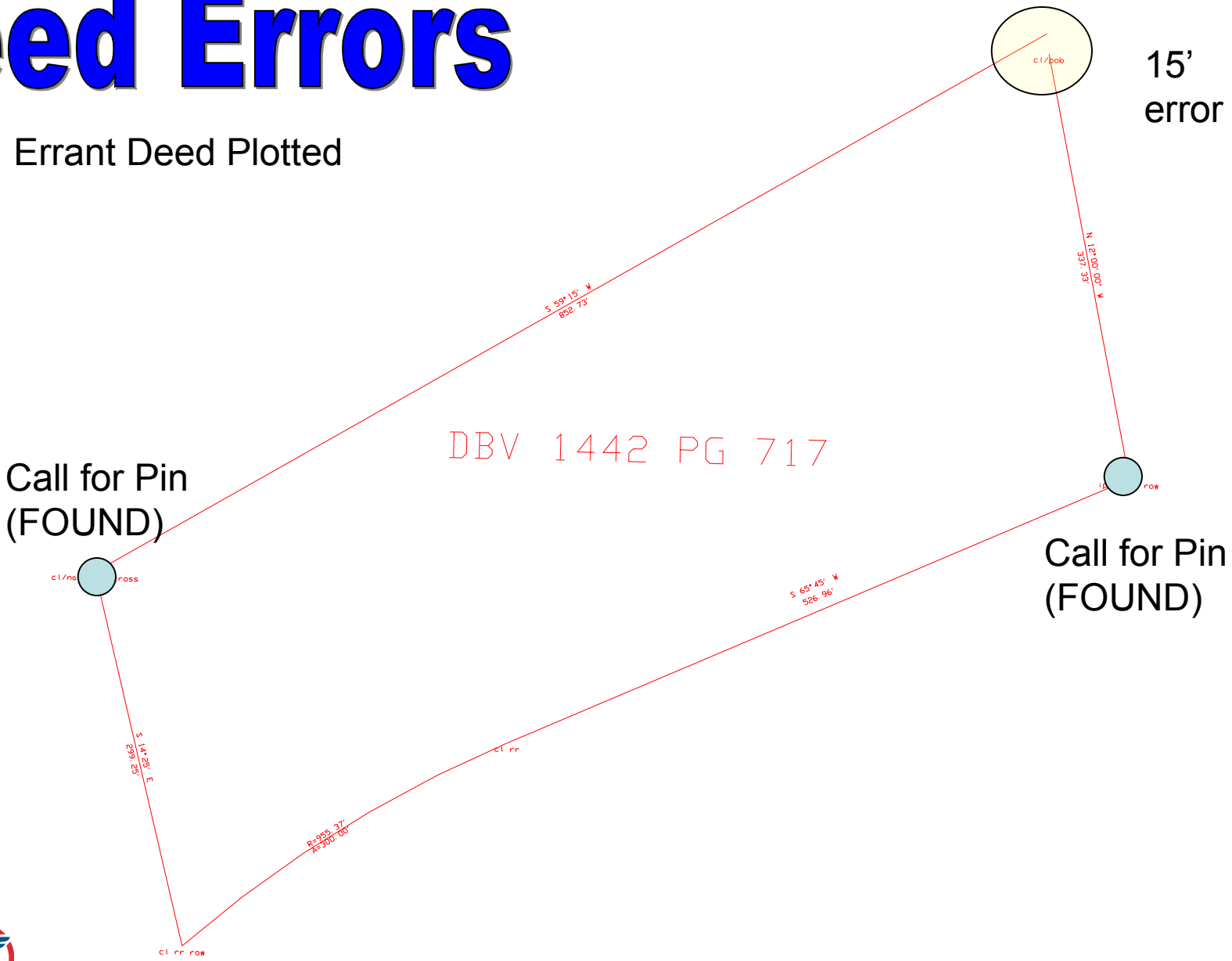


Lot 2 is rotated to fit Lot 1 common line (as the subject survey parcel is lot #1). Note there is no gap, and the 24" Oak is common to both lots and shown correctly.

Can anyone answer WHY the common lines would have two separate/different bearings?

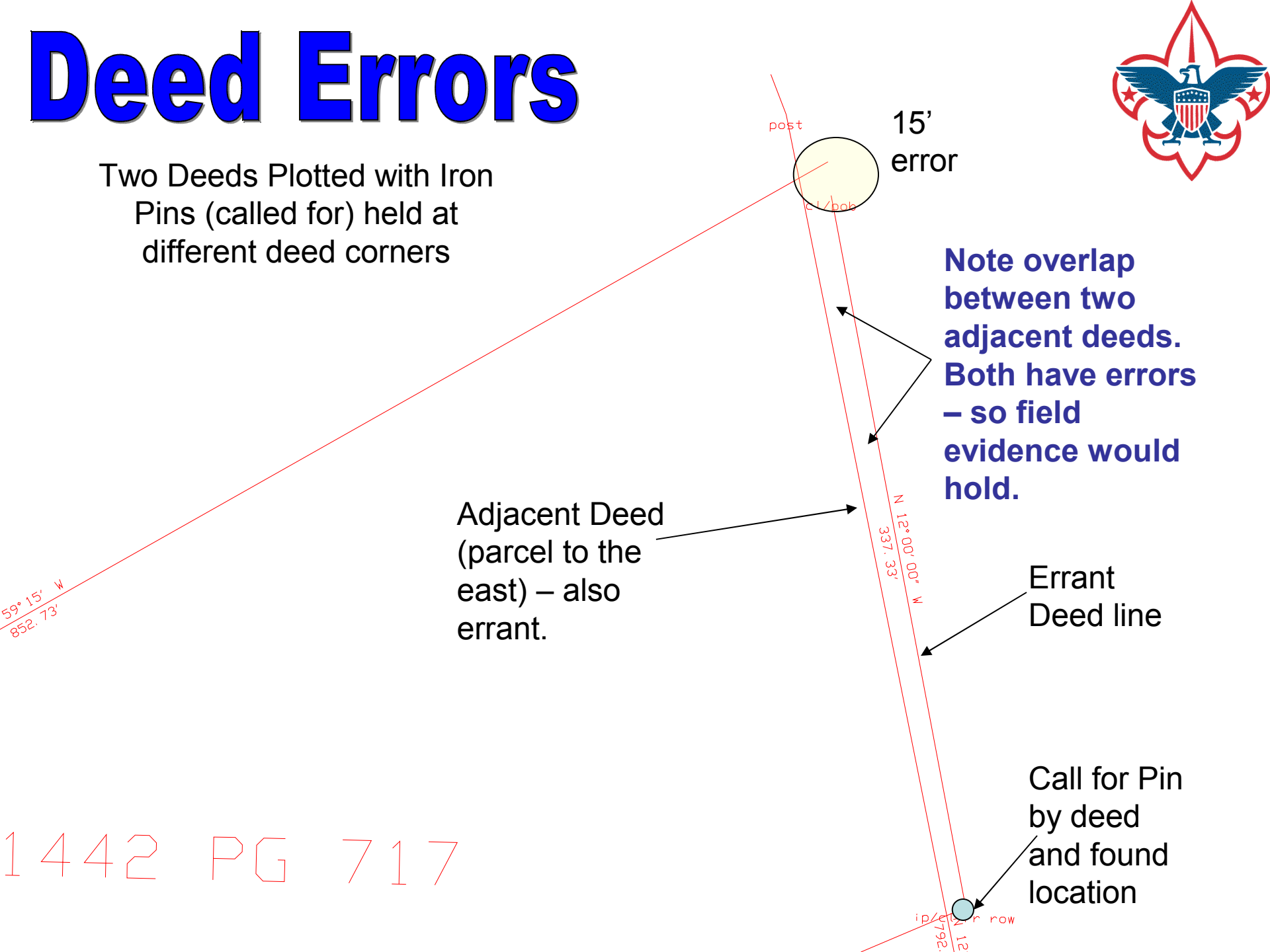
Deed Errors

Errant Deed Plotted



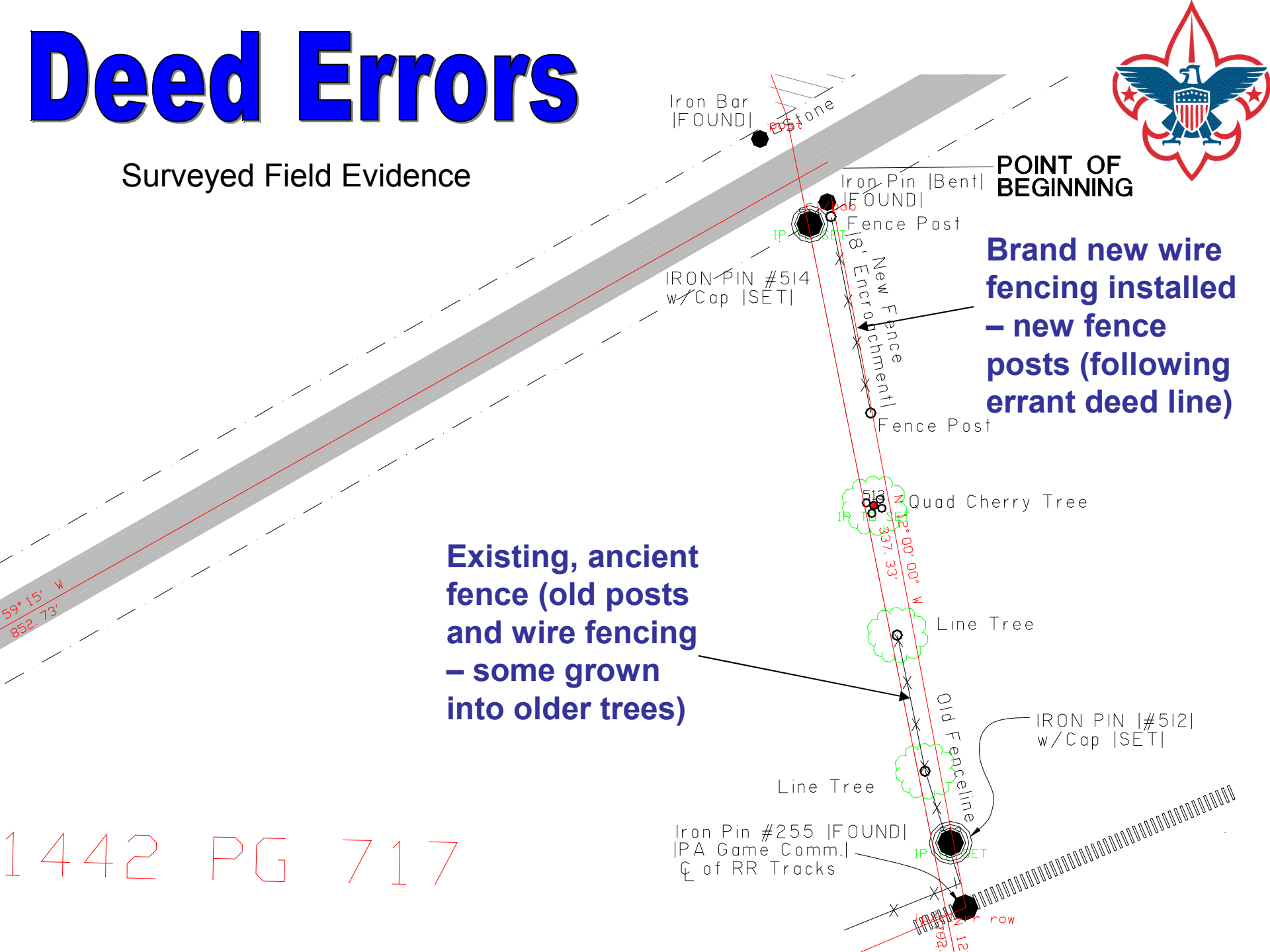
Deed Errors

Two Deeds Plotted with Iron Pins (called for) held at different deed corners



Deed Errors

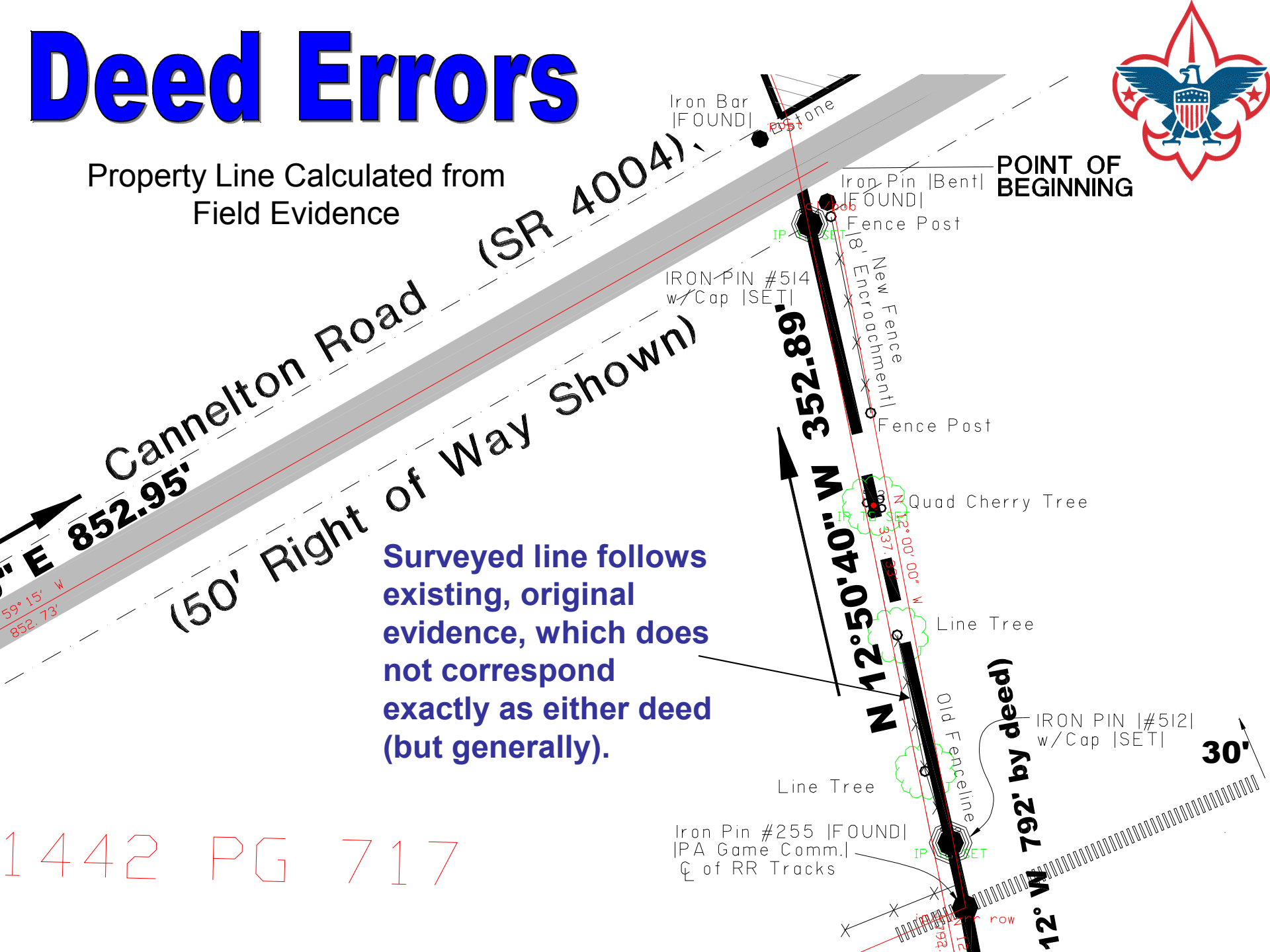
Surveyed Field Evidence



1442 PG 717

Deed Errors

Property Line Calculated from Field Evidence



Surveyed line follows existing, original evidence, which does not correspond exactly as either deed (but generally).

1442 PG 717